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50X1-HUM

CENTRAL INTELLIGENCE AGENCY
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FOREIGN DOCUMENTS OR RADIO BROADCASTS

REPORT
CD NO.

COUNTRY	USSR	DATE OF INFORMATION	1949
SUBJECT	Scientific - Biology, agriculture	DATE DIST.	19 Aug 1950
HOW PUBLISHED	Thrice monthly periodical		
WHERE PUBLISHED	Moscow-Leningrad	NO. OF PAGES	5
DATE PUBLISHED	1 Sep 1949	SUPPLEMENT TO REPORT NO.	
LANGUAGE	Russian		

THIS IS UNEVALUATED INFORMATION

SOURCE Doklady Akademii Nauk SSSR, Vol LXVIII, No 1, 1949

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TYPE DIFFERENCES OF WINTER GRAINS IN VERNALIZATION AT SUBFREEZING TEMPERATURES

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Submitted 18 Jun 1949

The problem of the effect of subfreezing temperatures on the development of winter grains was posed by early investigators but there were no practical solutions. This problem was solved for the first time by Academician T. D. Lysenko (1), who demonstrated that the primary phase of development in winter grains can be completed at temperatures lower than 0 degrees centigrade. This thesis of Lysenko's was used by his followers in research on altering the nature of plants (2, 3). Later the importance of subfreezing temperatures as one of the necessary conditions for development of winter grain (4) was demonstrated, the effect of subfreezing temperatures being superimposed here on that of temperatures above zero. The possibility of going through all phases of vernalization at subfreezing temperatures was first established by a group of workers at the Laboratory of Physiology, All-Union Institute of Plant Studies, under direction of V. I. Razumov (5).

The aim of this paper is to demonstrate the individuality of types in going through the phases of vernalization at subfreezing temperatures, so that the manner in which they undergo vernalization can be correlated with the specific phylogeny of each type. Included in the test were types of winter rye, and wheat of various geographical origins, differing in the length of the phases of vernalization. In the first part of the test, seed of these types of cultures were germinated and placed in refrigerators where, by means of cryohydrate solutions, temperatures of -3.8, -6, and -8 were maintained. In the other part of the test the germinated seed of Vyatka winter rye and Durable winter wheat were first kept for vernalization at a temperature of +2 degrees for 5, 15, and 25 days, and then transferred to chambers with temperatures of -6 and -8 degrees.

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Results of the first part of the test were arranged in Table 1 [appended].

It might be expected that the longer the period of vernalization, the easier it would be for a type to undergo it at subfreezing temperatures. However, the results of the tests did not confirm this hypothesis. It can be seen from Table 1 that the ability to undergo vernalization at subfreezing temperatures is not connected with the length of the vernalization phase. Such types of winter wheat as the Swedish Tulya 2 (which has the longest phase of vernalization) are not able to vernalize at -3.8 degrees, not to mention lower temperatures. At the same time the winter wheat, Lyutestsens 329, which has a shorter vernalization phase than the Swedish type, easily vernalized at the same temperature. The Kooperatorka, as well as Tulya 2, did not ear no matter how long it was allowed to vernalize at -3.8 degrees. The results obtained for winter wheat hold true for the types of winter rye. The winter ryes of northern origin (Chitinsk and Vyatka) are able to undergo vernalization at -6 degrees, although slowly. The earing of plants vernalized under the aforementioned conditions is slower by 19 to 25 days than the earing of those vernalized at +2 degrees. The more southern type, Tarashanskaya 2 (Kiev Oblast), is able to vernalize at -6 degrees, but requires 34 days longer in that case to ear. The most southern of the types studied, Turkestanskaya Mestnaya, cannot undergo vernalization at -6 degrees and, therefore, doesn't ear.

The data of the second part of the test are arranged in Table 2 and confirm the results of the first part.

As seen in Table 2, in all the cultures, the percentage of living kernels is greater in those cases where vernalization at subfreezing temperatures followed the treatment of the seed at +2 degrees, and with an increase in the number of days at +2 degrees, the percent of living kernels increases further. Similarly, the number of days before earing was decreased and the percent of earing stems was increased due to preliminary treatment as stated above. The data of Table 2 reconfirmed the variations in the behavior of winter rye and wheat in regard to final vernalization at subfreezing temperatures. Thus, winter rye can be completely vernalized at -8 degrees, even with a 5-day preliminary treatment at a temperature of +2 degrees. So that winter wheat may be completely vernalized not only at -8 degrees, but even at -6 degrees, it is necessary to keep it for 25 days at +2 degrees.

Thus, the collected data allows us to draw conclusions on the various reactions of the cultures and types to going through vernalization and prevernalization at subfreezing temperatures. Each culture and each type has its own limits below which this process cannot be completed successfully. For instance, winter wheat is able to undergo vernalization at a temperature not lower than -3.8 degrees, depending on type, but when prevernalized can do so at a temperature of -6 or even -8 degrees. Winter rye as a cultivated plant was formed by the processes of evolution under conditions of considerably lower temperatures and, therefore, it can undergo vernalization not only at -3.8 degrees, but even at -6 degrees. The low temperature limits for rye were not reached in our tests, but we presume that they lie much lower, around -10 or -12 degrees.

One of the reasons for the varied behavior of cultures and types in vernalization and prevernalization at subfreezing temperatures is, of course, their degree of frost resistance. In our work among winter wheats, the most frost-resistant type was Lyutestsens 329. This type also underwent vernalization at freezing temperatures more easily than all the other tested wheats. Among the winter ryes the most frost-resistant were Chitinskaya and Vyatka and they also gave a faster and higher percentage of earing when undergoing vernalization at subfreezing temperatures. In the same way, types of winter wheat such as Tulya 2 and Kooperatorka and of winter rye such as Turkestanskaya and Tarashchanskaya 2 are weakly resistant and although they underwent vernalization at -6 degrees (rye) and -3.8 degrees (wheat), they either did not ear at all, or else didn't ear subsequently to all the periods of vernalization.

Consequently, in winter grains the ability to vernalize at subfreezing temperatures is shown to be closely connected with the origin and the environment in which, throughout its history of development each and every culture and type was formed. For instance, years of meteorological observation in Saratov Oblast show that the autumn there is short and frequently dry. In the winter low air and soil temperatures set in quickly and the snow cover is often sparse. It is natural that under conditions of severe and snowless winter, only a type with a very high degree of frost resistance can be developed. During the whole historical development, freezing temperatures existed during the vernalization of this type; therefore, Lyutestsens 329 shows the ability to go through the first phase of its development at -3.8 degrees. Similarly, it can be said that northern types of winter rye like Chitinskaya (Siberia) and Vyatka (Kcrovskaya Oblast) were developed in conditions of a short autumn and very severe winter. This explains the ability of these ryes to undergo vernalization at -6 degrees. On the other hand, the phylogeny of a type of southern origin, such as the southern wheat Kooperatorka (Ukraine), the winter rye Turkestanskaya Mestnaya or Tarashchanskaya 2 (Kiev Oblast) has taken place under conditions of higher temperatures. Therefore they are not able to pass through the first stage of their development at subfreezing temperatures or else do not pass through it at all lengths of the vernalization phase.

The winter wheat Tulya 2 (Swedish) cannot be linked to the south by origin. However, a common reaction to vernalization at -3.8 degrees unites the Swedish and southern types. The absence of earing in Tulya 2 is explained when an analysis is made of the meteorological conditions of autumn and winter. The conditions in Sweden are basically southern with a mild prolonged autumn and fairly high soil temperature. The winter is mild, much snow falls, and in the coldest months the air temperature does not drop below -1 or -2 degrees (at latitudes 56-59°N). Hence, it is entirely natural that the Swedish type is not able to stand subfreezing temperatures well enough for vernalization to be carried out.

The results, we can see, lead to the conclusion that the total development of particular cultures and types has provided them with the ability to vernalize at subfreezing temperatures and has set the lower temperature limits of their ability to do so. A comparative ease of vernalization at low temperatures is pronounced in those cultures and types, the development of which is closely connected with low temperatures.

The present work was carried out under the immediate direction of V. I. Razumov, head of the Laboratory of Physiology, All-Union Institute of Plant Studies, Academy of Agricultural Sciences imeni V. I. Lenin.

BIBLIOGRAPHY

1. T. D. Lysenko, Agrobiologiya, 1948.

2. N. K. Shimanskiy, Selektsiya i Semenovodstvo, No 7, 1947.

3. T. Ya. Zarubaylo, M. M. Kislyuk, Selektsiya i Semenovodstvo, No 8, 1948.

4. Z. A. Kul-chitskaya, Dok Ak Nauk SSSR, Vol LVII, No 5, 1945.

5. V. I. Razumov, Dok Ak Nauk SSSR, Vol LX, No 4, 1948.

/Tables follow./

Table 1. Earing of Types of Winter Wheat and Rye Vernalized at Various Temperatures

Vernalization at Temp of (in days)			Days Until Earing						
			Winter Wheat			Winter Rye			
-6°	-3.8°	+2°	Lyutestsens	Tulya 2	Kooperatorka	Turkestanskaya Mestnaya	Tarashchanskaya	Chitinskaya	Vyatka
80	--	--	Doesn't ear			Doesn't ear		56	65
60	--	--				Doesn't ear	68*	57	63
40	--	--				49**	Tube	68	70
20	--	--					Doesn't ear		
--	80	--	57	Doesn't ear			Doesn't ear		
--	60	--	70						
--	40	--	65						
--	20	--	79						
--	--	80	60	52	45	35	37	36	36
--	--	60	59	56	44	33	34	38	40
--	--	40	62	--	49	38	39	42	43
--	--	20	83	77	58	51	48	51	65

* Percent of Eared Stems was 21.0

** Percent of Earing was 18.7

Table 2. Earing and Percent of Living Seeds After Vernalization at Constant and Varying Temperatures

Vernalization at Temp of (in days)					Winter Wheat of the Durable Type*			Winter Rye of Vyatka Type*		
Constant		Variable			% Living Seeds	Days Until Earing	% Eared Stems	% Living Seeds	Days Until Earing	% Eared Stems
-6°	+ 2	+ 2°	-6°	-8°						
60	--	--	--	--		Seed died		32.5	70	27.0
--	--	55	55	--	44.4	Doesn't ear		63.4	60	65.2
--	--	15	45	--	46.0			82.3	38	96.0
--	--	25	35	--	66.0	71	45.7	84.0	37	100.0
--	60	--	--	--	93.4	49	100.0	88.5	40	96.0
--	--	5	--	55	38.1	Seed died		49.7	68	16.3
--	--	15	--	45	38.1	Doesn't ear		80.0	52	27.2
--	--	25	--	45	50.4	88	14.4	83.1	49	80.0

* In both cultures the seed vernalized for 60 days at -8° died.

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